United States Patent [19]

Lim

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[45] **Date of Patent: Dec. 1, 1987**

[54] **DIASYWHEEL PRINTER WITH IMPROVED ADJUSTABLE CARRIAGE ASSEMBLY AND CARTRIDGE LATCHING MEMBER**

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[73] Assignee: **Genicom Corporation**, Waynesboro, Va.

[21] Appl. No.: **841,080**

[22] Filed: **Mar. 18, 1986**

Related U.S. Application Data

[60] Division of Ser. No. 762,021, Aug. 1, 1985, which is a continuation of Ser. No. 538,606, Oct. 3, 1983.

[51] **Int. Cl.**[4] **B41J 11/22**; B41J 11/20; B41J 19/56

[52] **U.S. Cl.** **400/352**; 400/59; 400/242; 400/335; 400/356; 292/254; 29/530; 248/273

[58] **Field of Search** 400/637.1, 642, 647.1, 400/354, 356, 691, 693, 694, 352, 353, 355, 208, 242, 243, 692, 335, 320; 292/254; 29/530; 248/27.3

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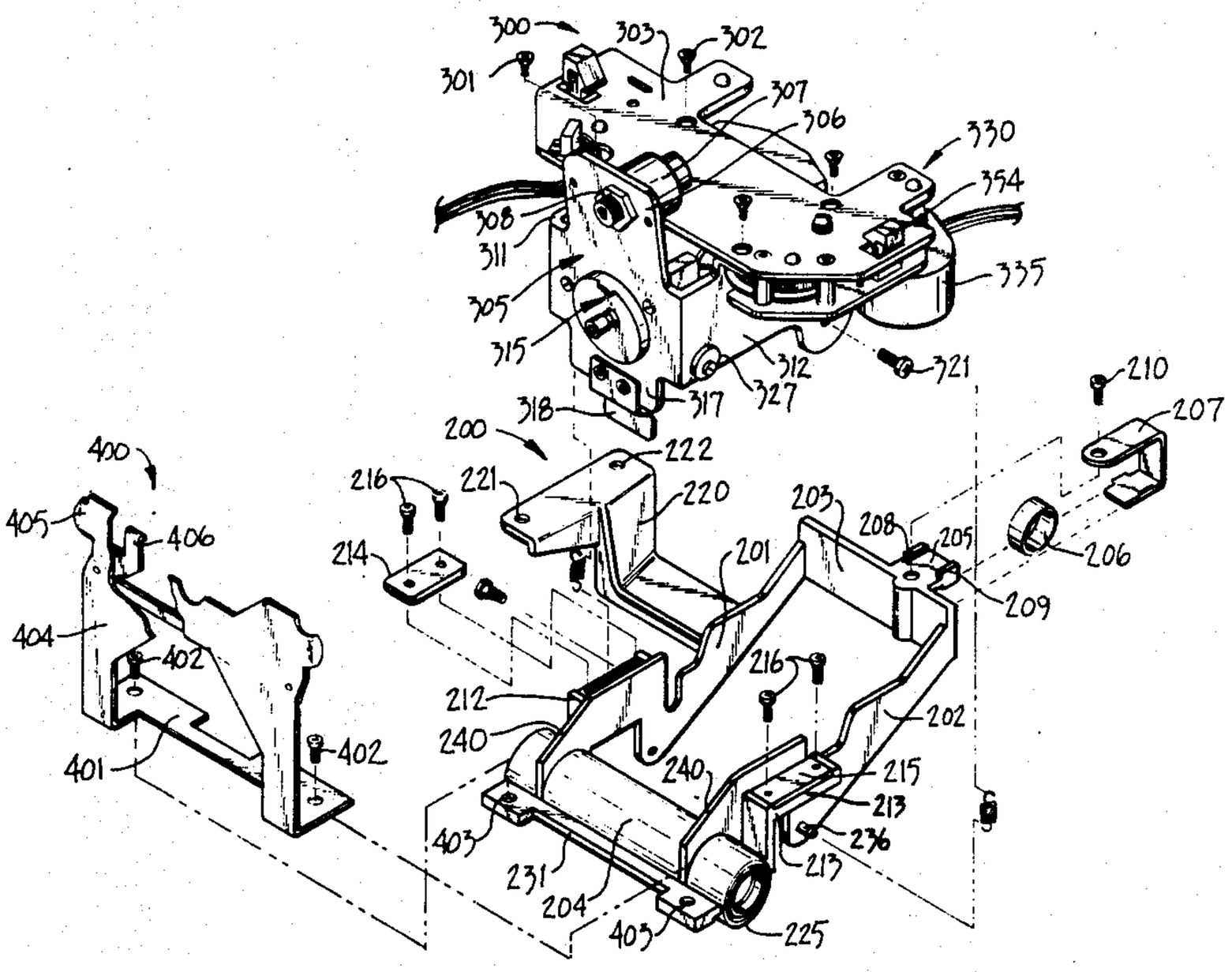
Primary Examiner—Charles A. Pearson
Assistant Examiner—James R. McDaniel
Attorney, Agent, or Firm—Nixon & Vanderhye

[57] **ABSTRACT**

An adjustable carriage assembly for a printing device having a print mechanism to be translated along a linear print path. The carriage assembly includes an upper carriage sub-assembly and a lower carriage sub-assembly, the lower carriage sub-assembly having a pair of laterally spaced arm members joined together by a pair of cross members. Each arm member has an open pivot slot and a support ramp portion. A spring coupled between the upper and lower carriage sub-assemblies in the region adjacent the pivot portions provides a spring detent for the upper carriage sub-assembly with respect to the lower carriage sub-assembly in both the first operative position and a second inoperative position. The guide members are adjustable eccentric washers.

A cartridge latch is configured to be removably mounted in an aperture formed in a platform on the upper carriage sub-assembly. The latch comprises a unitary member having a lower U-shaped portion with one leg terminating at an upper end in an outwardly extending flange and the other leg having an outwardly extending keeper nib located below oppositely extending flange portions and spaced therefrom, an upper portion having a cartridge abutment surface, and a relatively stiff web portion joining the upper portion to the top surface of the flange portions.

6 Claims, 23 Drawing Figures



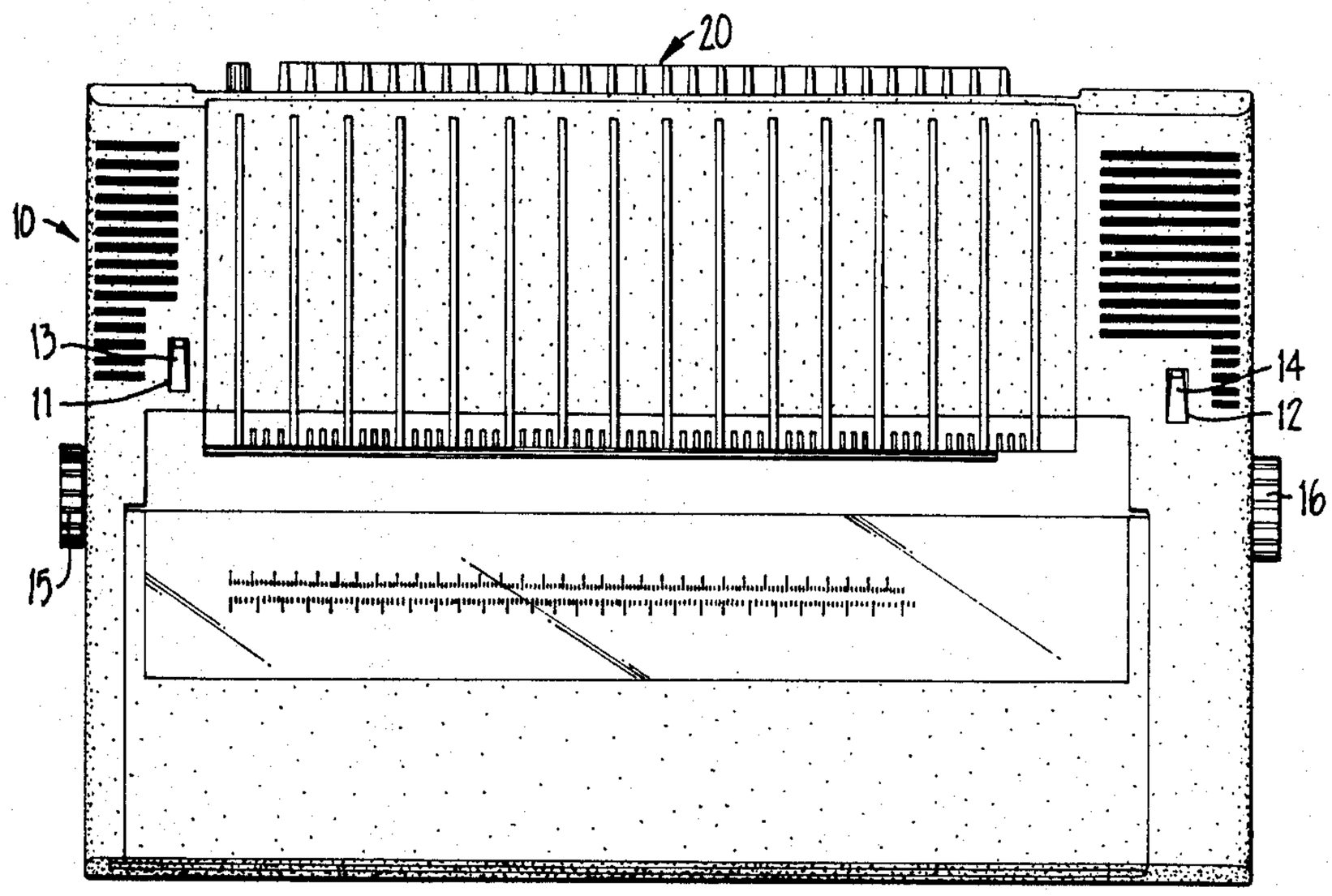


FIG. 1.

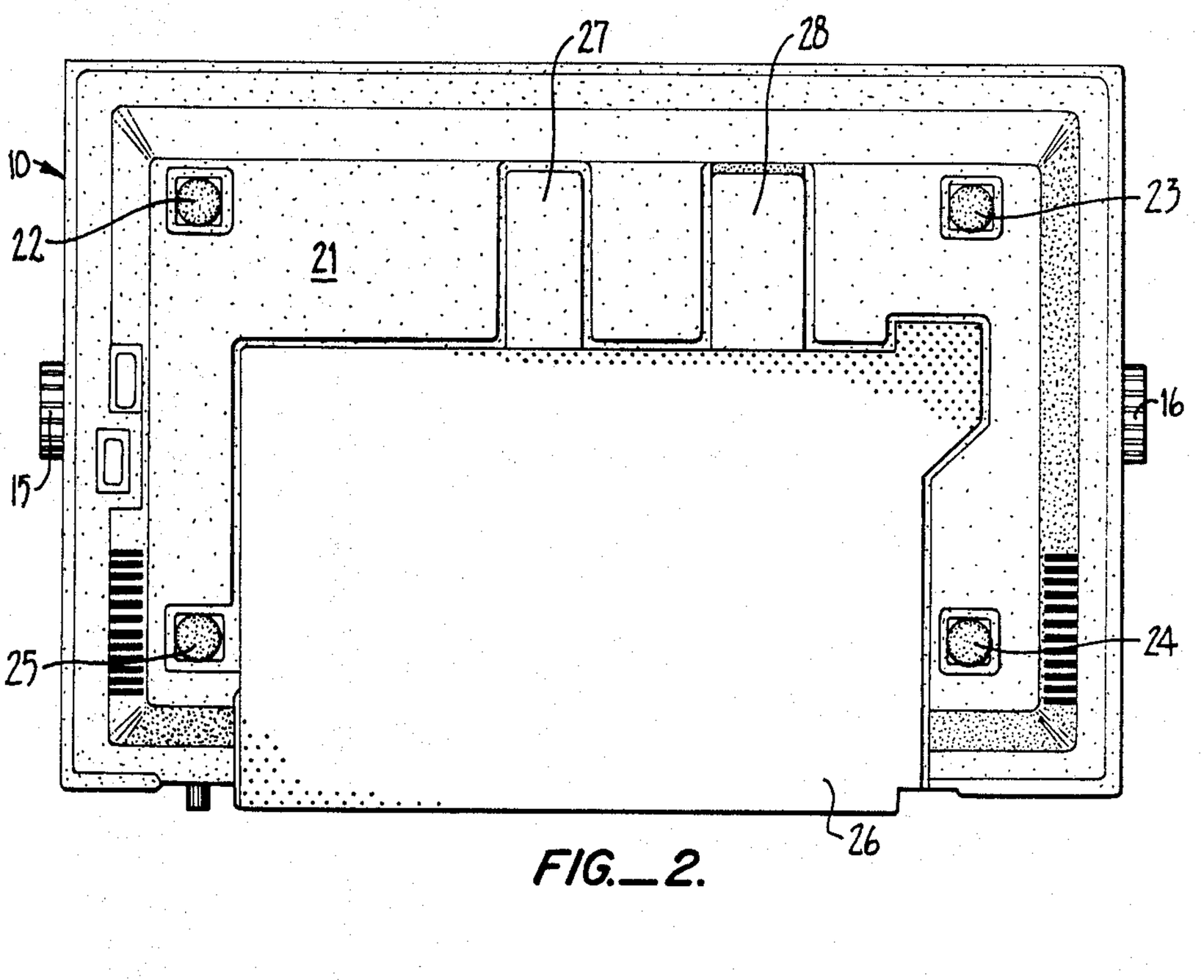
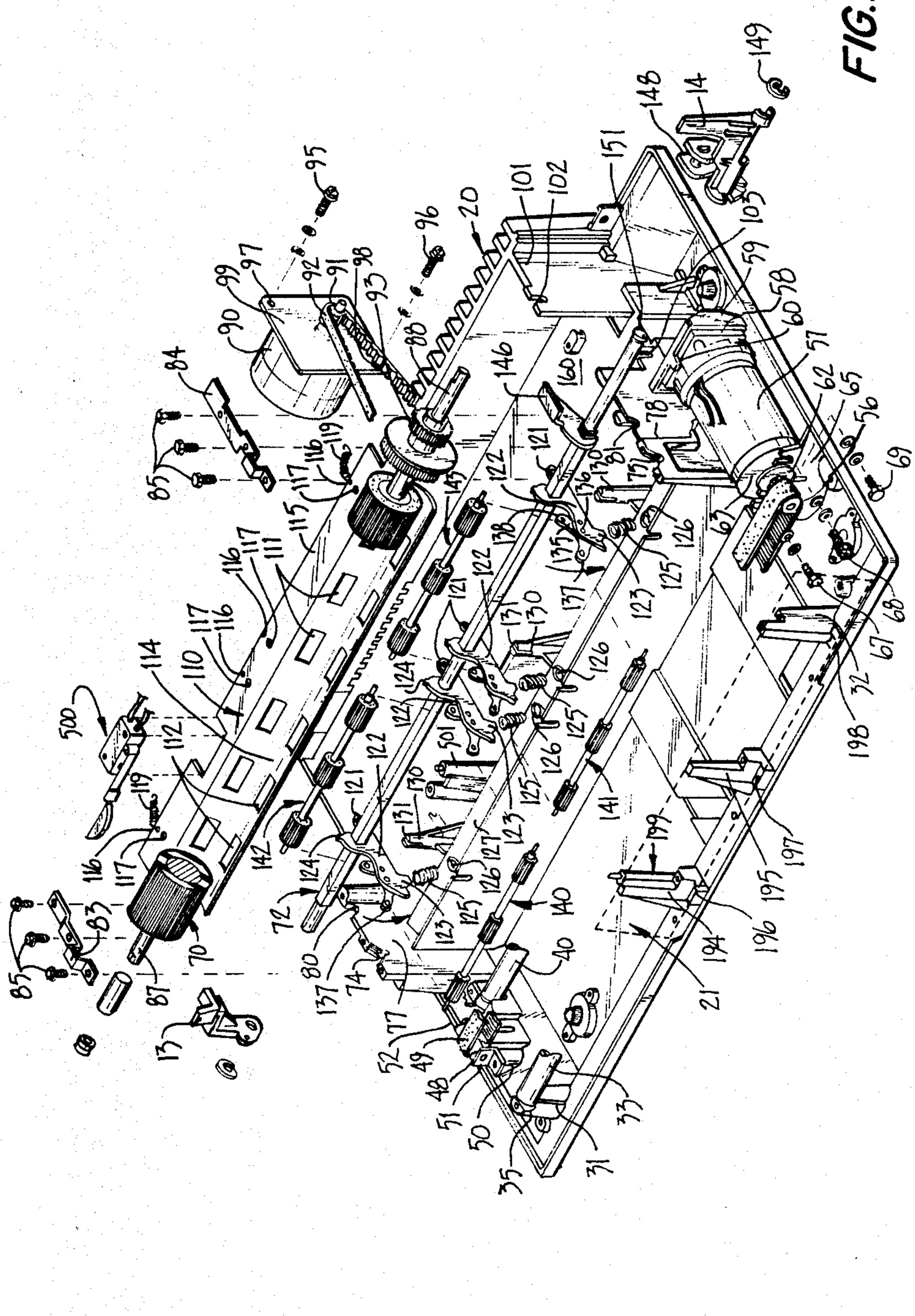


FIG. 2.

FIG._3.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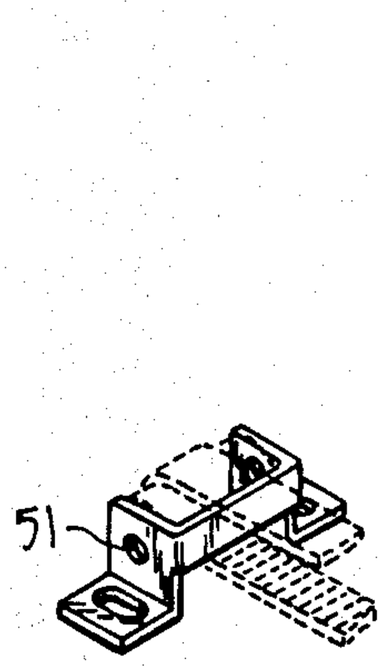

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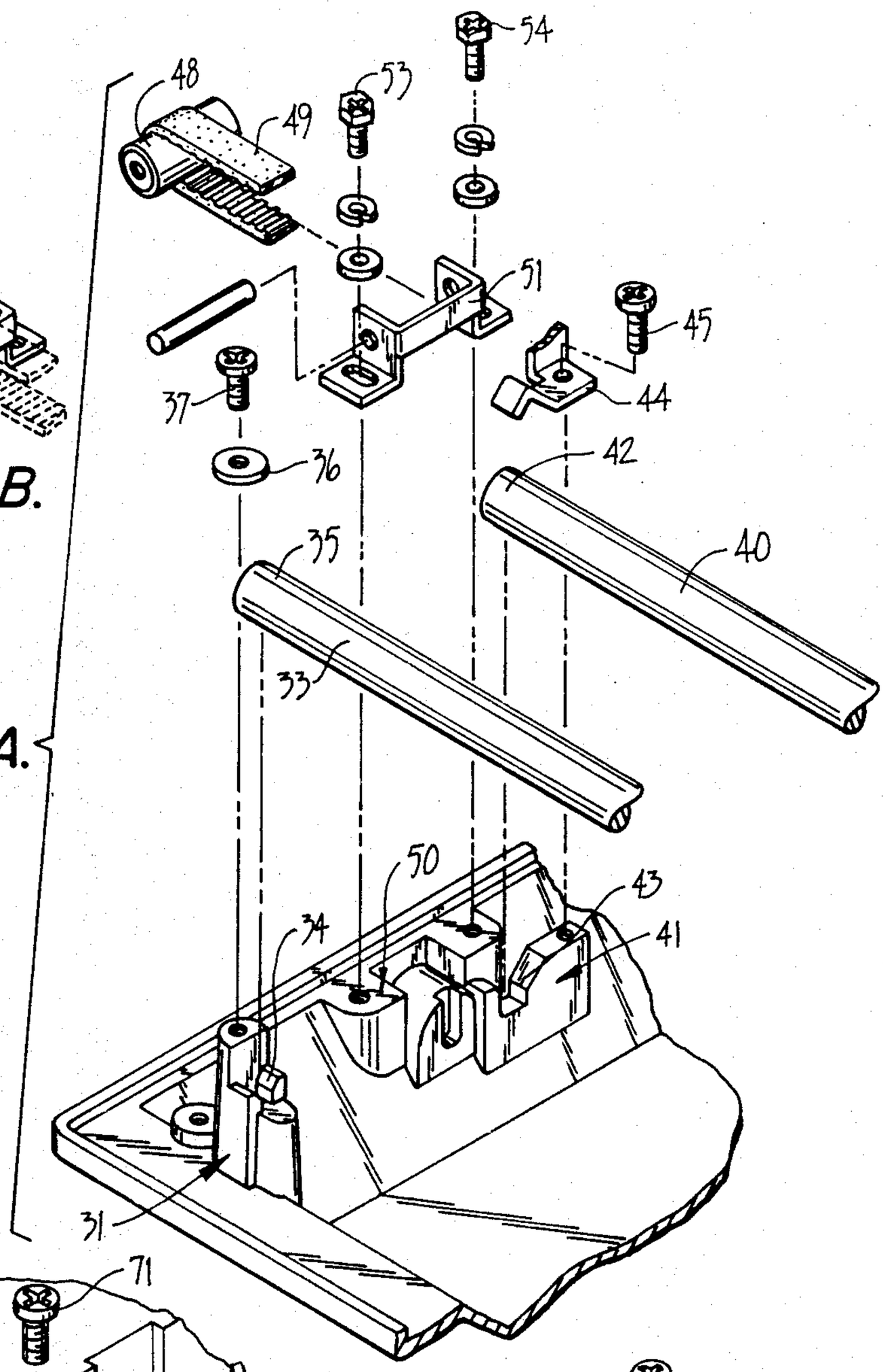
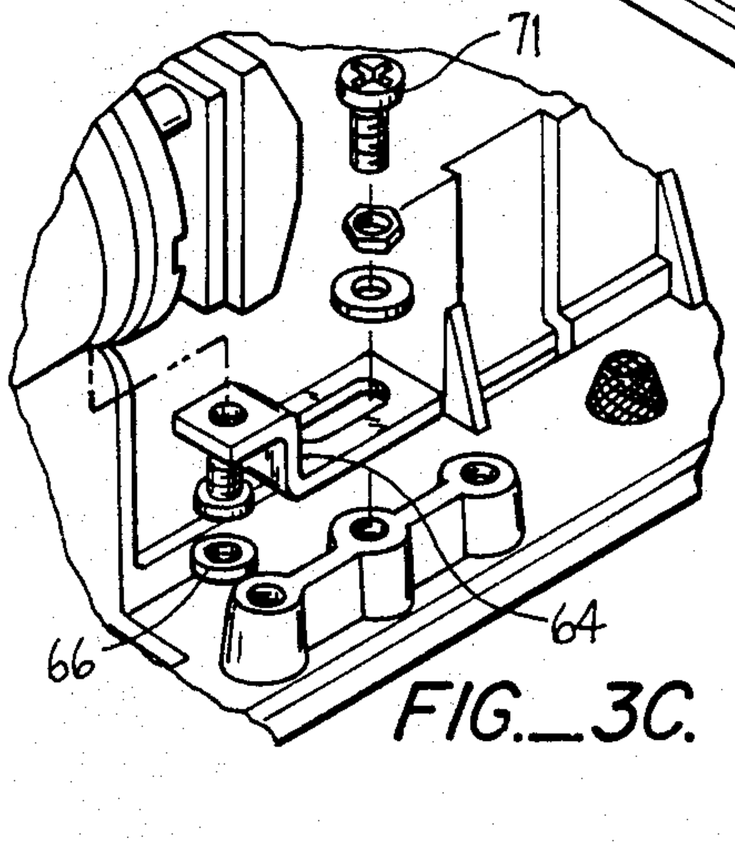


FIG._3A.



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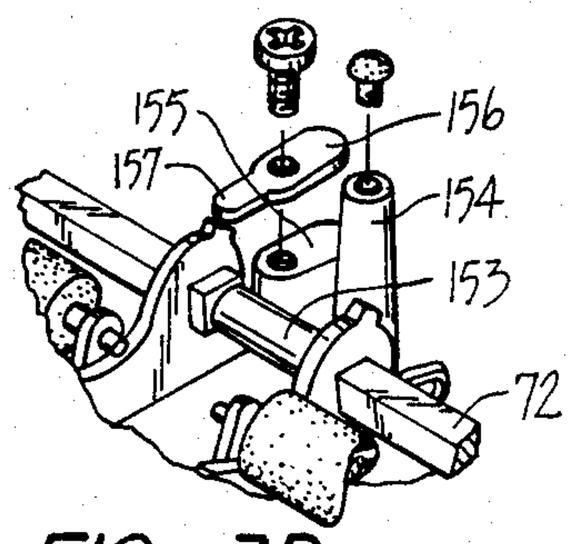

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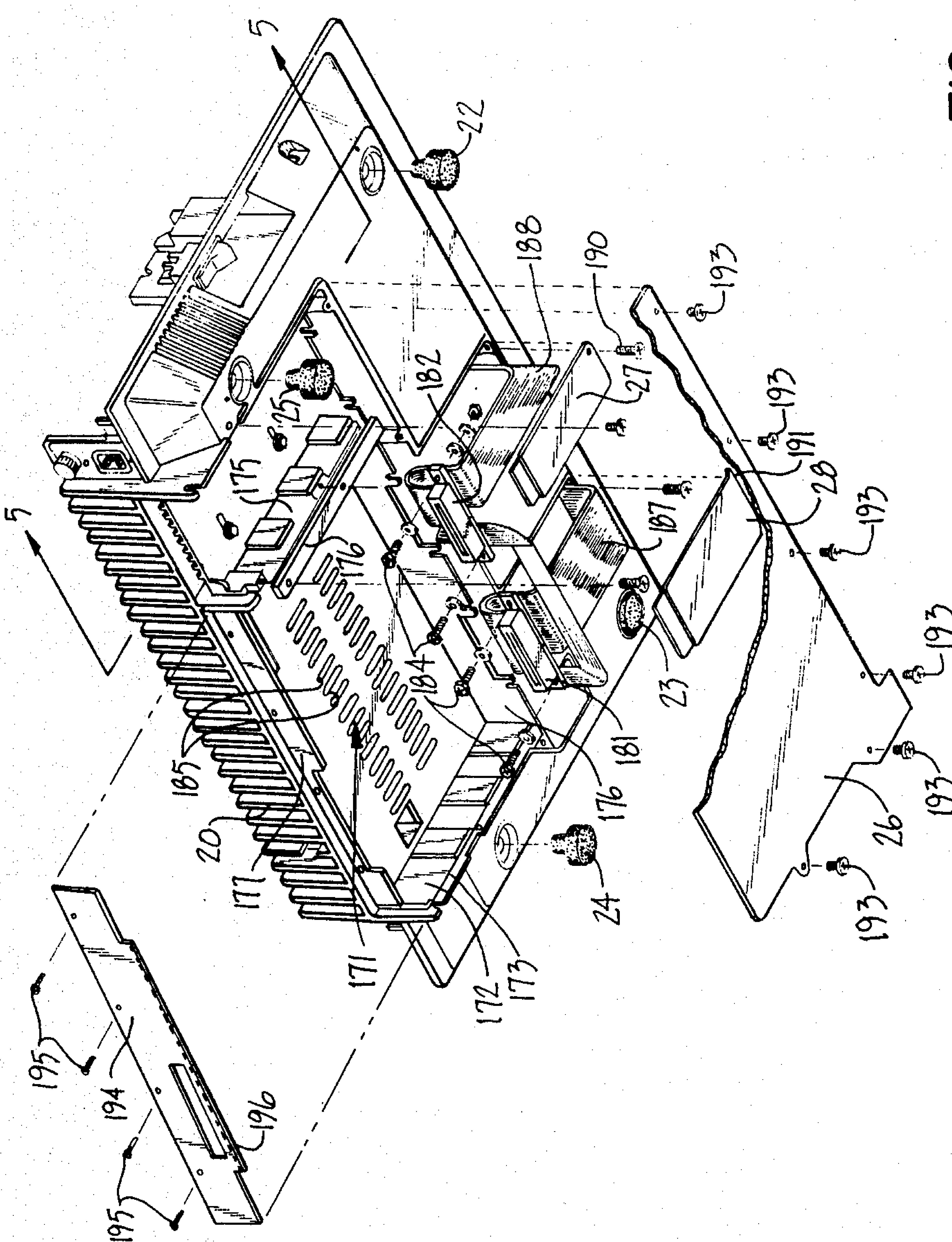
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FIG._4.

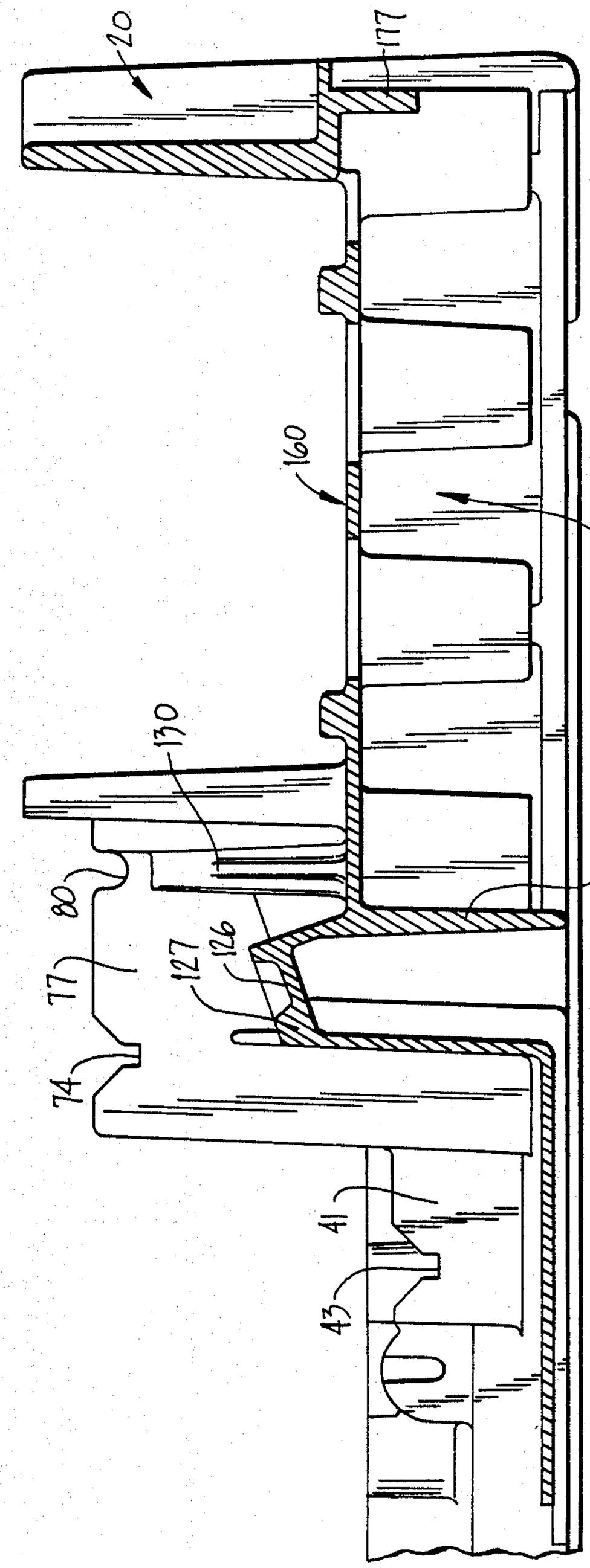

FIG._5.

FIG._6.

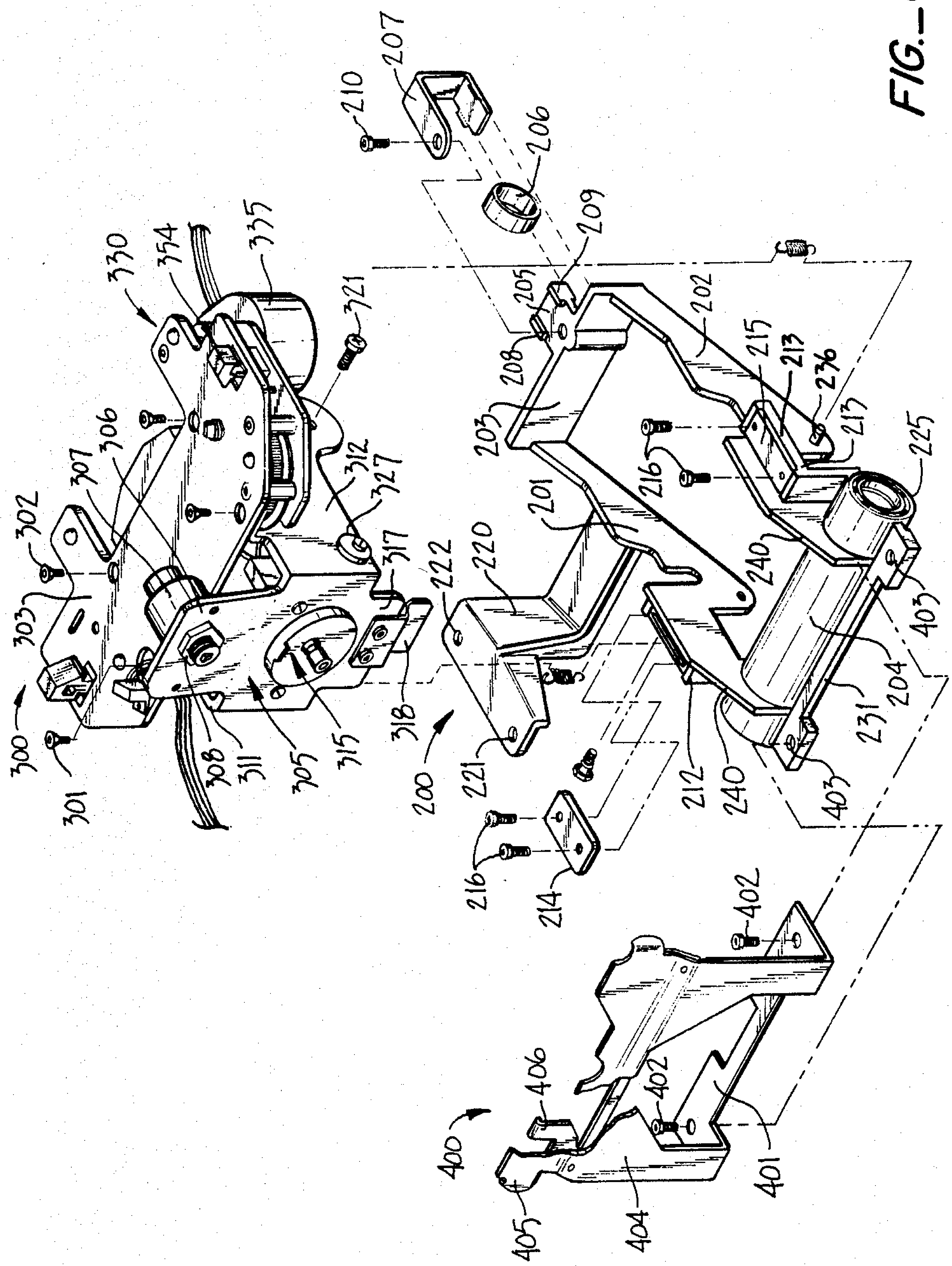
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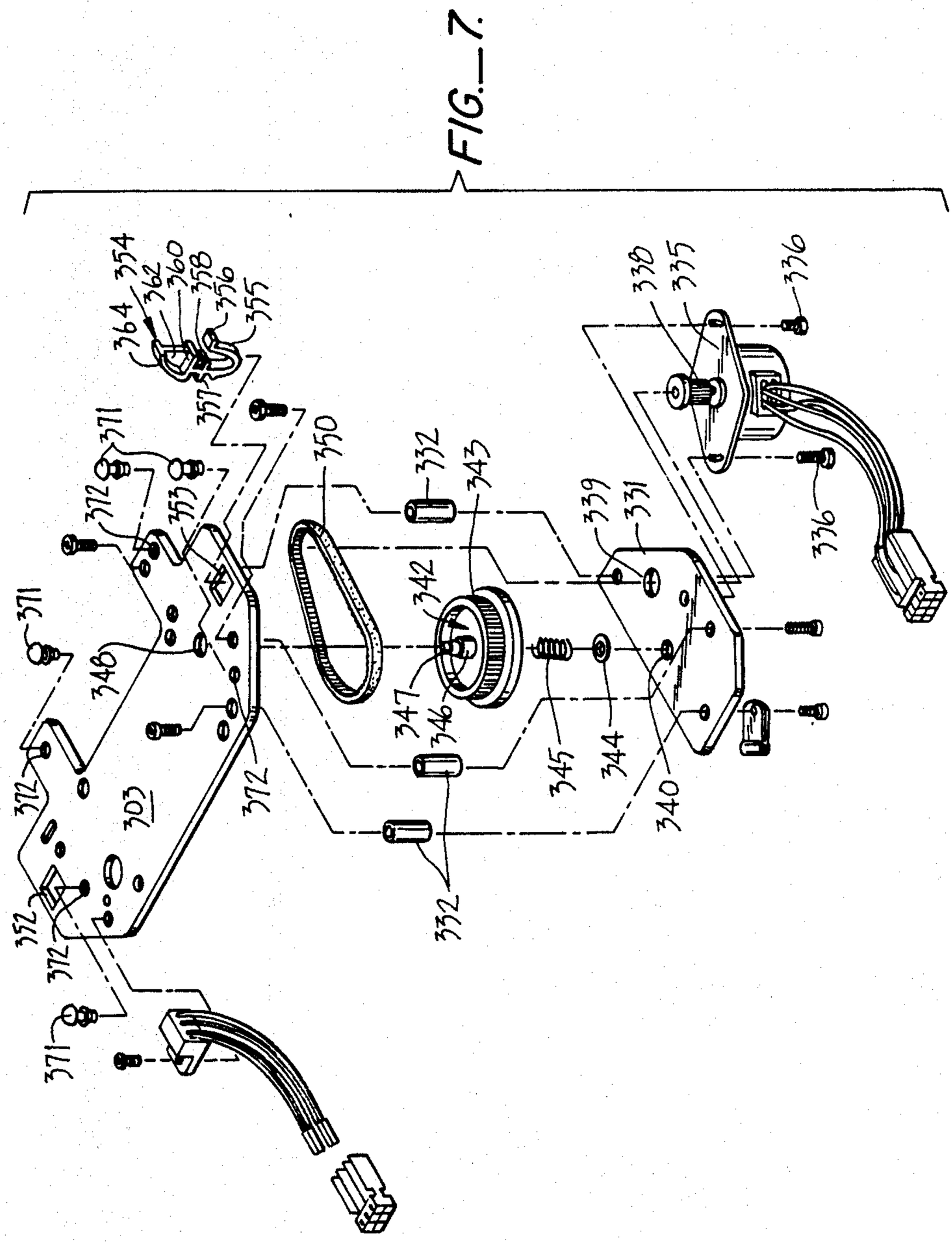
FIG.—7.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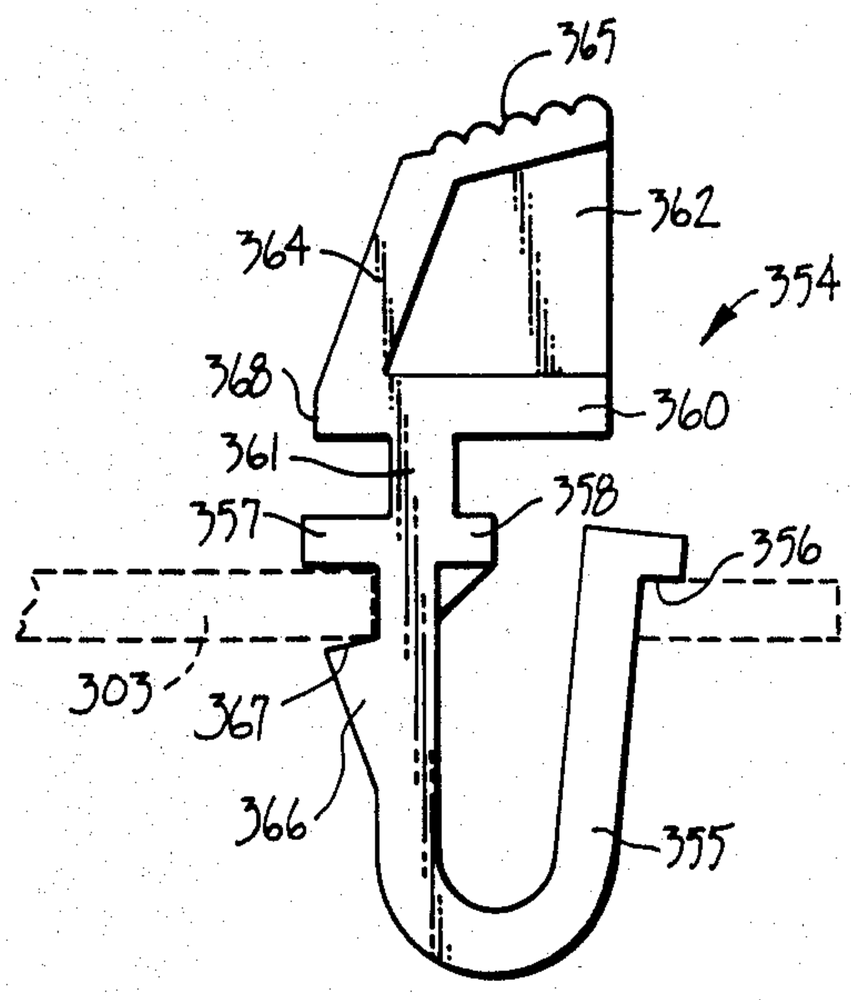
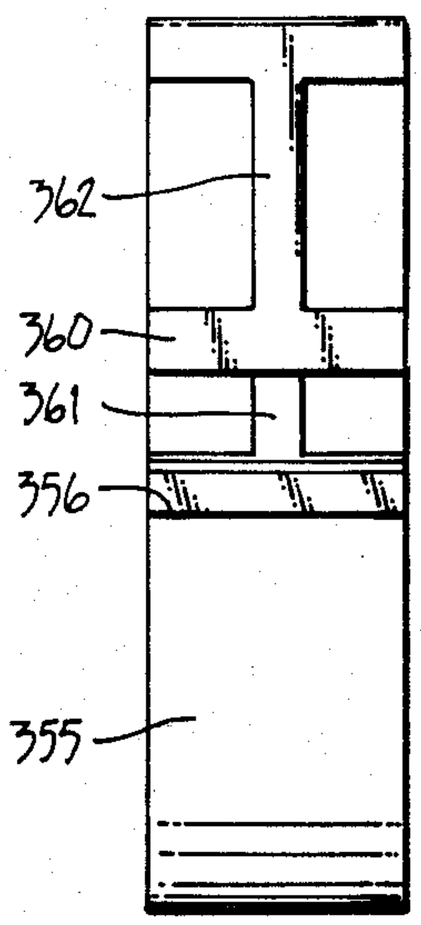


FIG._7A.



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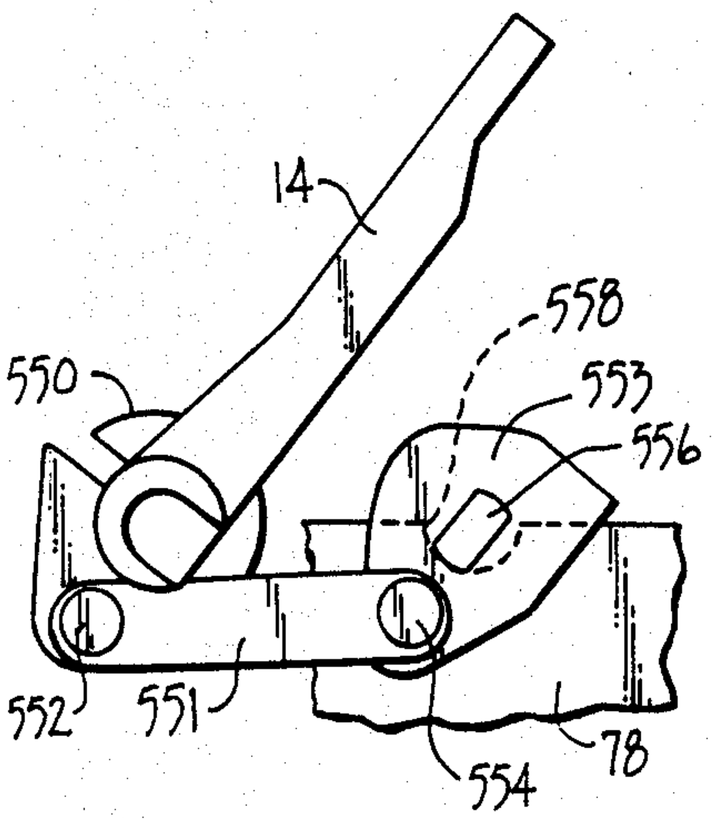

FIG._13.

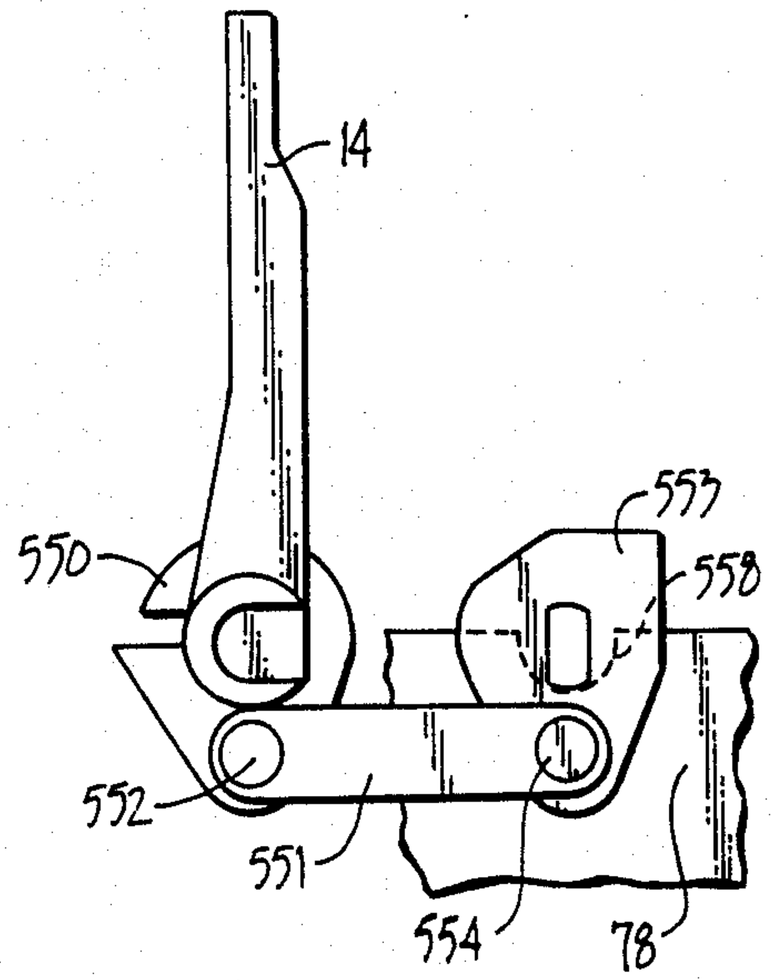

FIG._14.

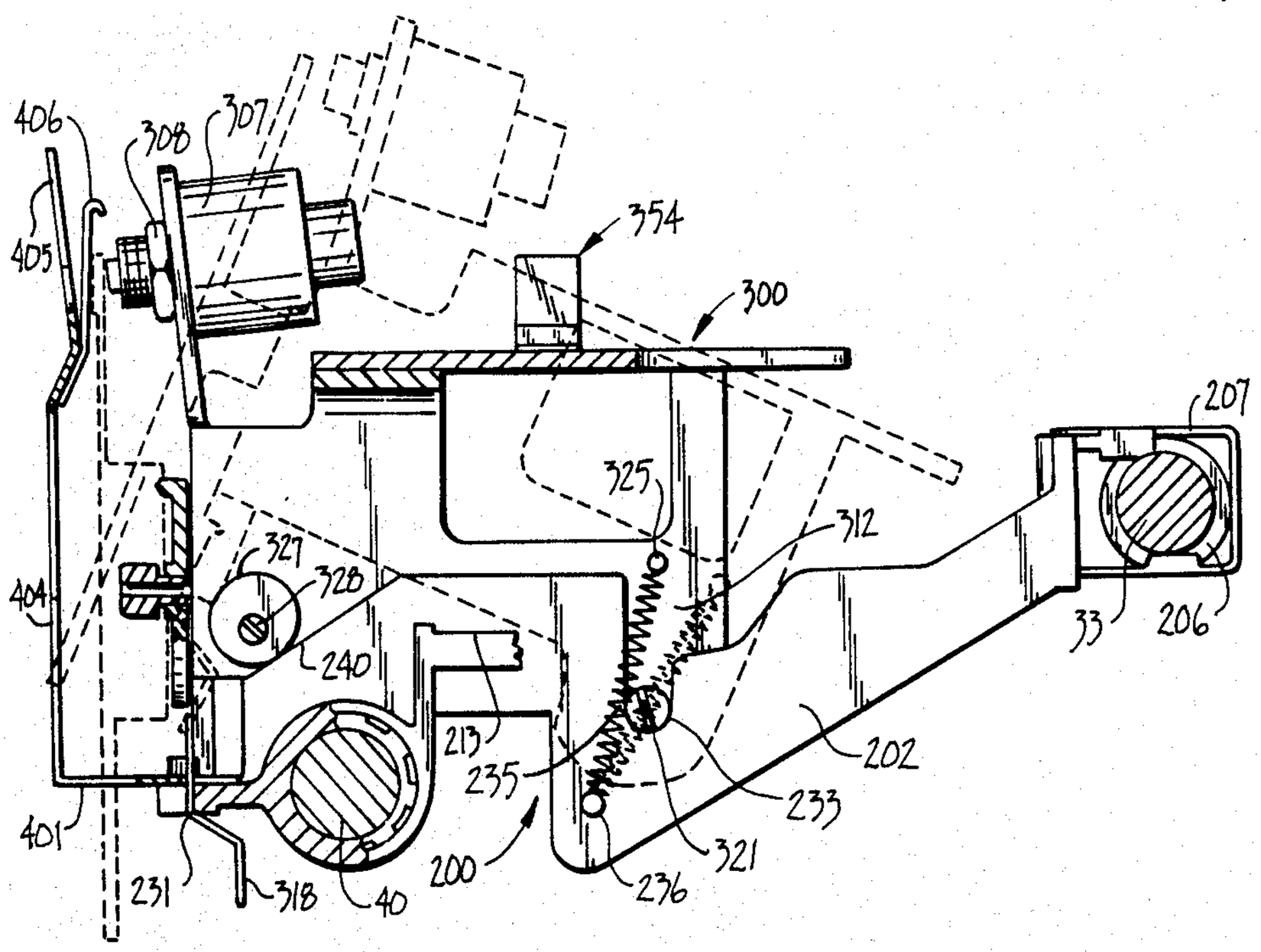
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FIG._8.

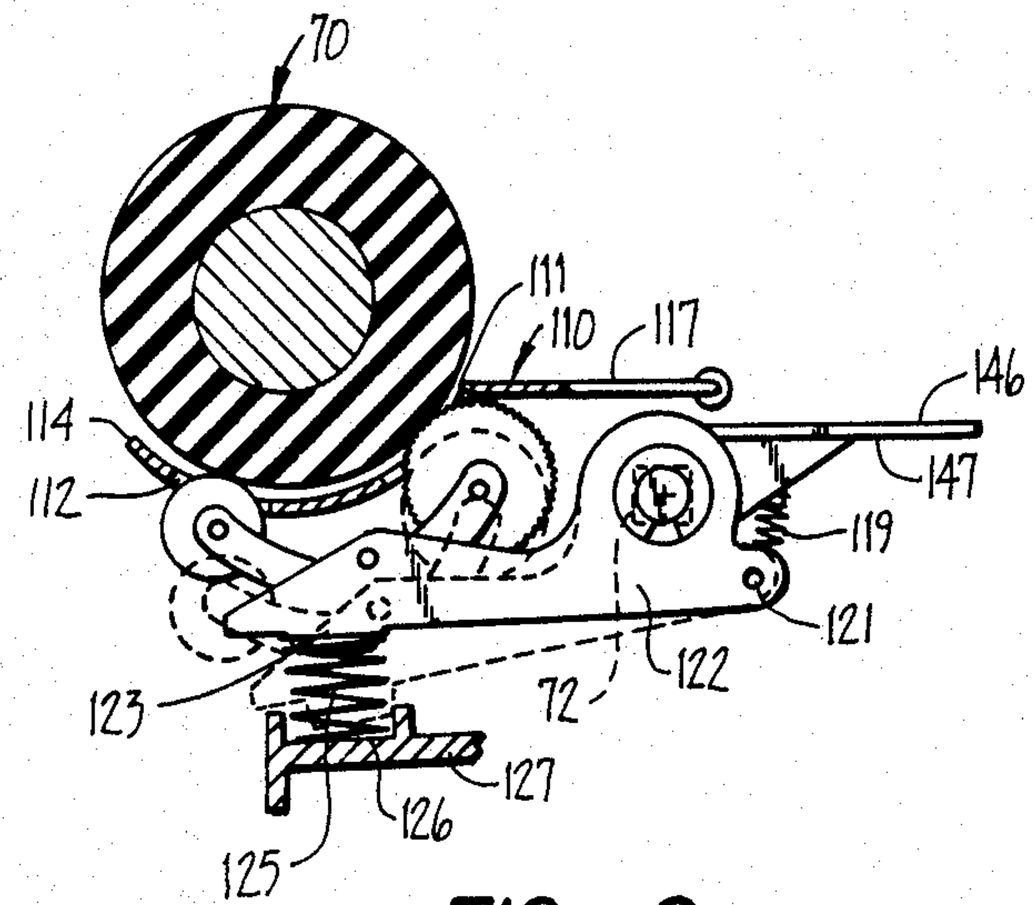
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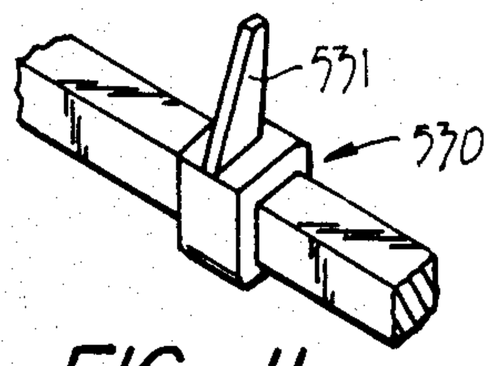
FIG._9.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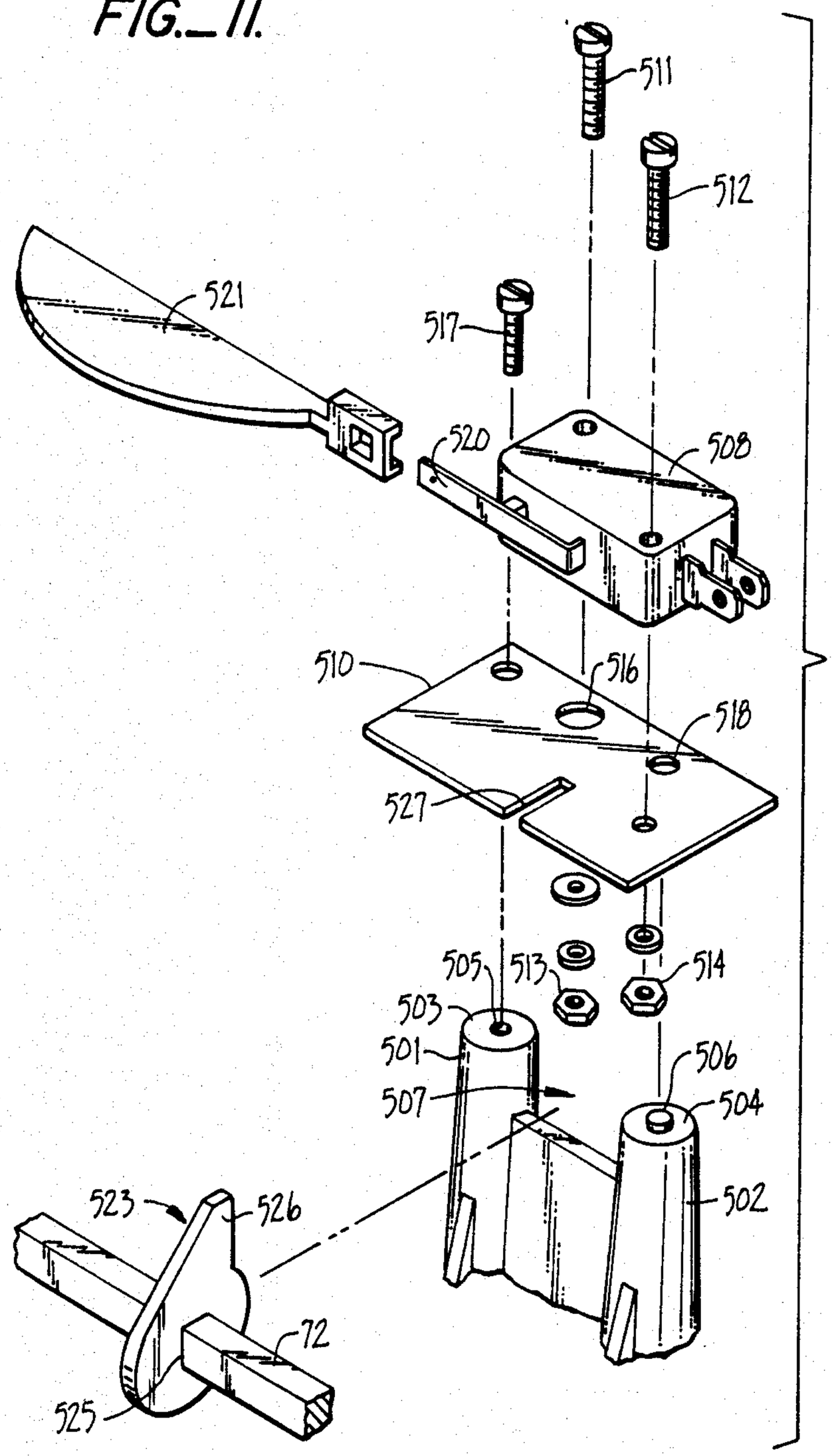
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FIG._10.

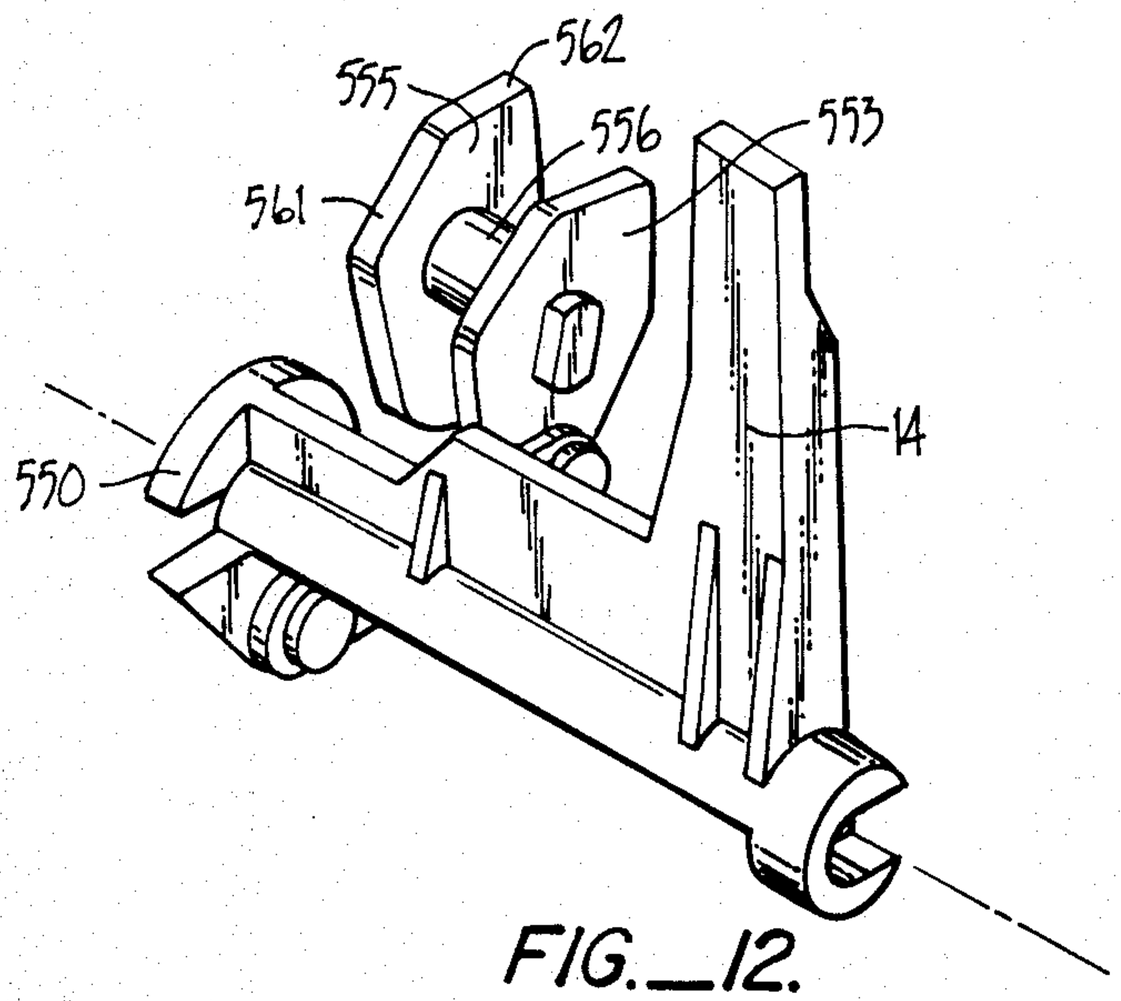

FIG. 12.

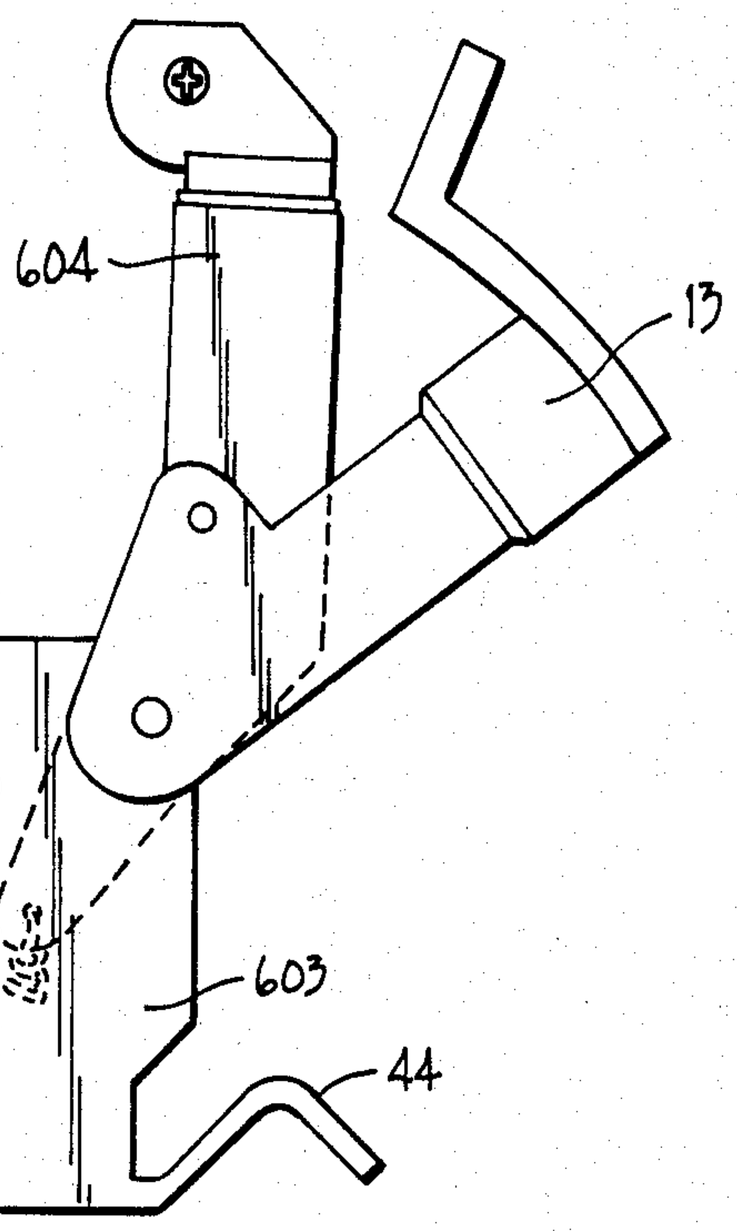

FIG. 17.

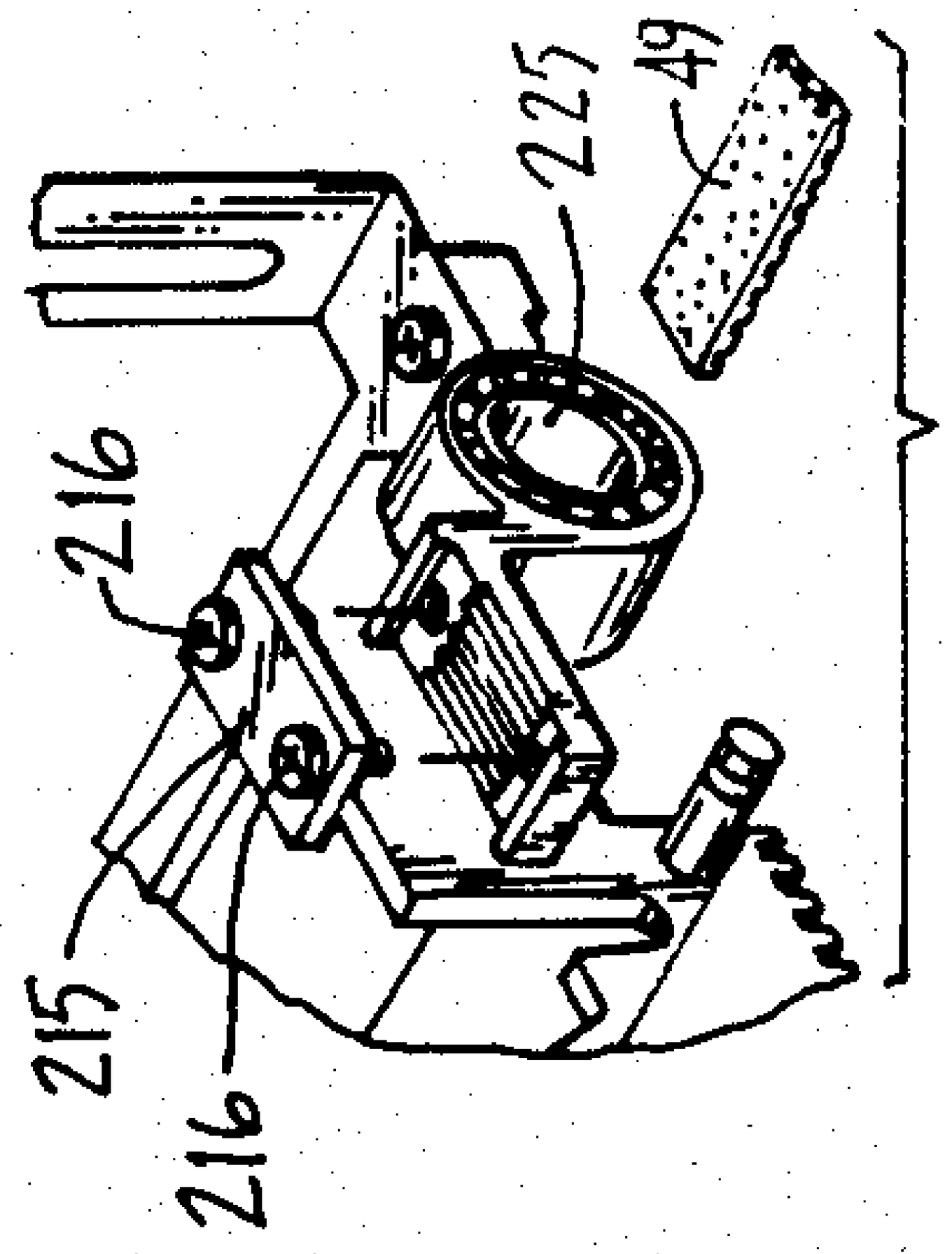
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FIG._16.

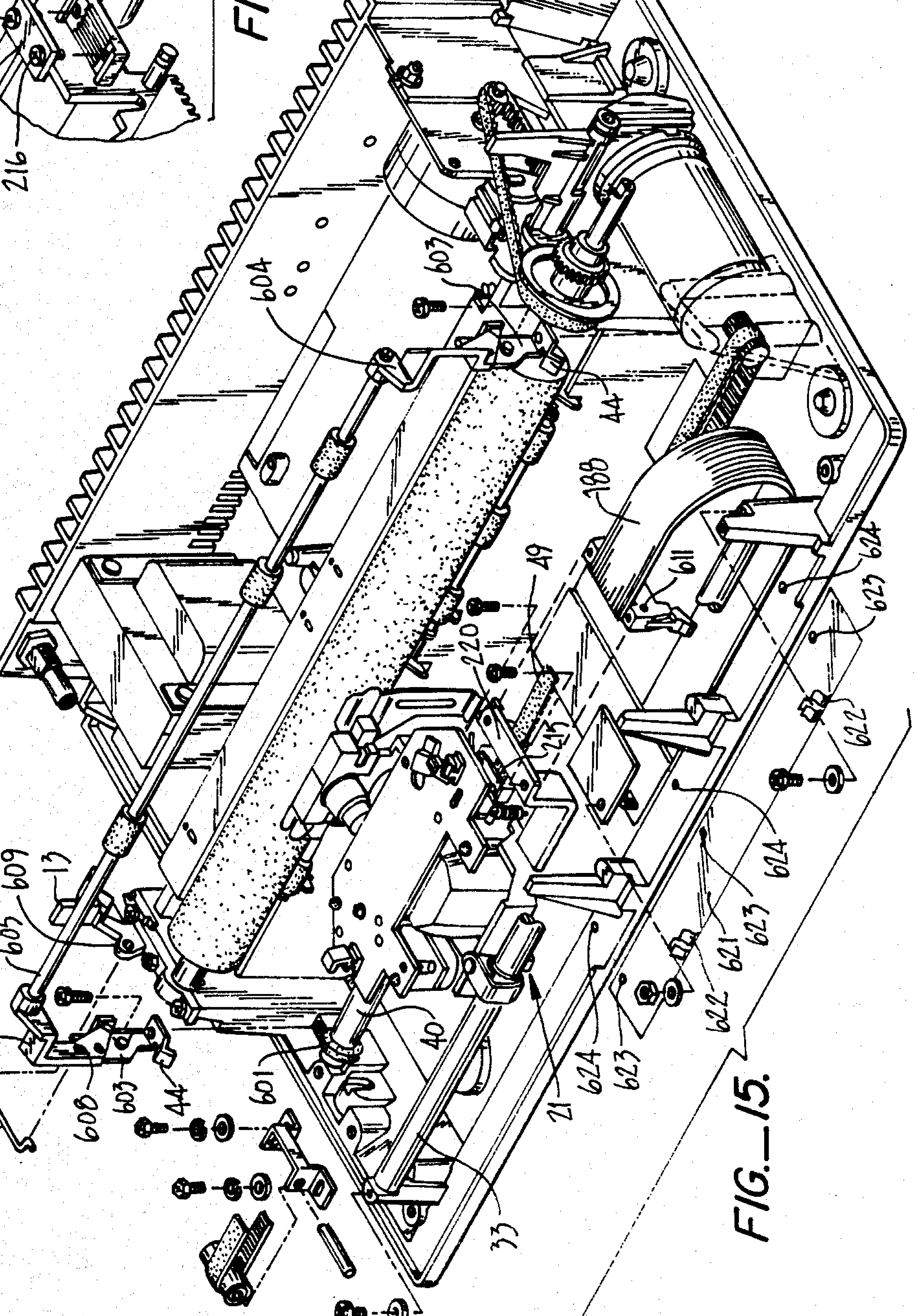
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FIG._15.

DIASYWHEEL PRINTER WITH IMPROVED ADJUSTABLE CARRIAGE ASSEMBLY AND CARTRIDGE LATCHING MEMBER

STATEMENT OF RELATED CASE

This application is a divisional application of U.S. patent application Ser. No. 762,021 filed Aug. 1, 1985 for Daisywheel Printer with Improved Mounting for Mechanical Elements, which is a continuation of application Ser. No. 538,606 filed Oct. 3, 1983 for Daisywheel Printer.

BACKGROUND OF THE INVENTION

This invention relates to electromechanical printers of the type having a rotary print wheel mounted on a translatable carriage, commonly known as "daisy wheel printers".

Printing devices are known which employ a rotary print wheel mounted on a carriage for translation across the width of the print throat area for character printing. The carriage is typically mounted for sliding movement along a pair of spaced guide rods arranged in parallel fashion to the axis of a rotatable platen, and the print wheel is typically removably carried by the output shaft of a motor mounted to the carriage for translation therewith. A print hammer assembly is typically mounted above the print wheel motor, along with a support plate and driving mechanism for a removable ribbon cartridge. The removable ribbon cartridge typically contains either an endless ribbon or a ribbon mounted on a pair of reels. These mechanical mechanisms are typically contained within a printer housing, along with a carriage drive motor, motion translation mechanisms such as belts or cables and pulleys mechanically coupled between the carriage drive motor and the carriage, a platen stepper motor, a motion translating mechanism coupled between the platen stepper motor and the platen for providing paper feed around the platen, a paper deflector and pressure rollers, a mechanism for operating the platen pressure rollers, various switches and the electronic circuitry required to operate the mechanical components of the printer.

In the past, the carriage typically included a plurality of individual arm and platform members fastened together with individual fasteners and providing an upper carriage assembly and a lower carriage assembly pivotably mounted with respect to one another.

The removable ribbon cartridge is normally supported on a platform using some type of releasable latching mechanism, which enables a spent cartridge to be removed and replaced by a fresh cartridge. While several latching mechanisms are known, all suffer from one or more disadvantages, which include multi-element latches requiring the separate assembly of individual component parts, the use of separate guide posts or mechanical cartridge stops for registration purposes, and interally molded, frangible loction studs.

SUMMARY OF THE INVENTION

The invention comprises an improved carriage assembly which affords a relatively simple adjustment device for relative positioning of upper and lower carriage sub-assemblies, and an extremely simple carriage latch device.

In a first aspect, the invention further includes an improved carriage assembly having upper and lower carriage means requiring only a small number of mechanical parts. The lower carriage means supports the upper carriage means and comprises a unitary member having a pair of laterally spaced arm members each provided with a pivot slot and a support ramp portion, a rear tube portion joining the arm members at the rear, and a front cross brace joining the arm members in the front. The rear tube portion is dimensioned to accommodate a first carriage support rod, and the front cross brace supports a front bearing means dimensioned to accommodate a second carriage support rod. The upper carriage means includes a pair of laterally opposed support studs, each received in a different one of the pivot slot and a pair of laterally opposed guide members, each located rearwardly of the respective one of the support studs, the guide members normally engaging corresponding support ramp portions when the carriage assembly is in a first operative position. Spring means are coupled between the upper and lower carriage means in the region adjacent the pivot portions, the spring means being arranged for over center travel to provide a spring detent for the upper carriage means with respect to the lower carriage means in the first operative position and in a second inoperative position. In the preferred embodiment, the guide members are adjustable eccentric washers which afford a simple but accurate adjustment for the relative position between the upper and lower carriage means.

In a further aspect of the invention, an improved ribbon cartridge releasable mechanical latch is provided which is constructed from a single moulded piece of suitable material, such as Delrin, and which provides the usual ribbon cartridge latching function with a single unitary part.

The cartridge latch comprises a unitary member having a lower U-shaped portion with one leg terminating at an upper end in an outwardly extending flange and the other leg having an outwardly extending keeper nib located below oppositely extending flange portions and spaced therefrom, an upper portion having a cartridge abutment surface, and a relatively stiff web portion joining the upper portion to the top surface of the flange portions. The upper portion of the latch includes a substantially flat floor portion, an upwardly extending angled wall portion joined to the floor portion along an edge, a top portion joined to the upper edge of the wall portion, and a vertical web extending between the top portion and the floor portion. The top portion preferably has a serrated upper surface, and the vertical web is preferably aligned above the relatively stiff web portion.

The guide member aspect of the invention provides a relatively accurate adjustable positioning mechanism to control the relative spacing between the upper carriage and the lower carriage and is relatively simple to install and adjust without the need for substantial technical expertise. The latch aspect of the invention provides an extremely simple, low cost latching device which is relatively simple to install and which provides an efficient releasable latching operation for the removable cartridge.

For a fuller understanding of the nature and advantages of the invention, reference should be had to the ensuing detailed description taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a top elevational view of a printer incorporating the invention;

FIG. **2** is a bottom elevational view of the printer of FIG. **1**;

FIG. **3** is a first exploded isometric view of the printer of FIG. **1** with the cover and certain elements removed and other elements partially broken away;

FIG. **3A** is an enlarged detail view of the integral carriage rod support elements and retainers;

FIG. **3B** is a perspective view of the pulley bracket;

FIG. **3C** is an enlarged detail view of an optional carriage motor support mechanism;

FIG. **3D** is an enlarged detail view of the control rod central retainer;

FIG. **4** is an exploded bottom isometric view of the printer of FIG. **1** with the bottom plate partially broken away;

FIG. **5** is a sectional view taken along lines **5—5** of FIG. **4**;

FIG. **6** is an exploded perspective view of the carriage and card/paper guide assemblies;

FIG. **7** is an exploded perspective view of the ribbon cartridge support and drive assembly;

FIG. **7A** is a side elevational view of the ribbon cartridge latch;

FIG. **7B** is an end elevational view of the latch of FIG. **7A**;

FIG. **8** is a right edge view, partially broken away of the carriage and print wheel;

FIG. **9** is a right edge view illustrating the platen pressure roller actuating mechanism;

FIG. **10** is an enlarged detail view of an alternate embodiment of the paper-out switch;

FIG. **11** is an enlarged detail view of an alternate embodiment of the paper out switch override element;

FIG. **12** is an enlarged perspective view of the pressure roller operating lever mechanism;

FIGS. **13** and **14** are end views illustrating operation of the mechanism of FIG. **12**;

FIG. **15** is a view similar to FIG. **3** showing the carriage assembly and paper bail installed;

FIG. **16** is an enlarged detail view showing the carriage bolt fastening arrangement; and

FIG. **17** is an enlarged end view of the paper bail mechanism.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Turning now to the drawings, FIG. **1** illustrates a daisy wheel printer incorporating the invention with the finishing cover installed. As seen in this Fig., the printer includes a finishing cover generally designated with reference numeral **10** for enclosing the internal components of the printer. Cover **10** is provided with a pair of apertures **11, 12** for accommodating a pair of manually operable levers: a paper bail lever **13**, and a platen pressure roller lock and release lever **14** described in more detail below. A pair of platen operating knobs **15, 16** releasably mounted on opposite ends of the platen shaft (illustrated below) are arranged at opposite sides of the housing cover **10**. Visible in FIG. **1** is a ribbed heat sink portion of the base structure generally designated with reference numeral **20**.

With reference to FIG. **2**, the side walls of the finishing cover **10** generally surround an integrally cast metal base member generally designated with reference numeral **21** provided with four vibration dampening support feet **22–25**. A bottom metal cover plate **26** is also provided to enclose a printed circuit board recess (described below), plate **26** also serving to partially capture a pair of auxiliary cover plates **27, 28** (illustrated fully in FIG. **4**).

With reference to FIG. **3**, the integral cast base **21** is formed in a unique shape incorporating all of the major mounting support elements for the mechanical and electromechanical components of the printer. In particular, a first pair of support posts **31, 32** are formed along the forward portion of the base **21** near the corners to provide vertical support for a first carriage guide rod **33** extending therebetween. The contour of support post **31** is illustrated in FIG. **3A** and is seen to comprise a generally notched central portion **34** for receiving the end **35** of of the forward carriage guide rod **33**. The configuration of the central portion of support post **32** is identical to that of **31**. The end **35** of forward carriage guide rod **33** is anchored in place by means of a keeper element **36** and a fastener **37**.

Also with reference to FIGS. **3** and **3A**, a rear carriage guide rod **40** is similarly supported by means of an integrally moulded guide **41** and a corresponding guide hidden from view in FIG. **3**, guide **41** having a notched central portion **43** for receiving the end **42** of the rear carriage guide rod **40**. The rear carriage guide rod is secured in place in the support **41** by means of a keeper **44** forming part of a bail mechanism (described below) and a threaded fastener **45**. The right end of rear carriage guide rod **40** is similarly secured.

A ball bearing cylindrical pulley **48** for the carriage drive belt **49** is secured to a support member **50** integrally formed in the base by means of a bracket **51** and threaded fasteners **53, 54**. The other end of the carriage drive belt **49** is received about a driving gear **56** secured to the output shaft of a DC servo motor **57**. Servo motor **57** has a rear location portion **58**, generally rectangular in shape, which is received by a cover member **59** having a stop tab **60** extending forwardly of the unit. The forward end of motor **57** has a mounting boss **62** formed in the front plate **63** and received in a circular cradle formed in a support partition **65** integrally formed in the base **21**. Three threaded fasteners **67–69** are used to secure the motor **57** to the support **65**, each fastener **67–69** passing through a separate slot formed in support **65** and being received in a threaded aperture in plate **63**. If desired, a rear support bracket **64** (FIG. **3C**) may be installed at the rear of motor **57**, the bracket **64** being secured to a hidden threaded aperture by means of screw **66** and to the base **21** by means of a fasterner **71**.

The platen **70** and a pressure roller operating rod **72** are each mounted in a different pair of cradles: the platen support cradles **74, 75** are each formed in a forward portion of a pair of integral support walls **77, 78**; while the ends of the pressure roller operating rod **72** are received, respectively, in notched portions **80, 81** of support members **77, 78**. Both the platen **70** and control rod **72** are captured in their mounts by means of a single pair of keepers **83, 84** secured to the upper surface of the support walls **77, 78** by threaded fasteners **85**.

The platen **70** can be either manually operated by means of knobs **15, 16** (FIG. **1**) which are fitted onto the opposite ends **87, 88** of the platen assembly **70**, or automatically by means of a stepper motor **90** having an output gear **91** and a timing belt **92** received about the output gear **91** and a platen drive gear **93**. Stepper

motor **90** is secured to the base **21** by means of a pair of threaded fasteners **95, 96** each arranged to be threaded into a different aperture **97, 98** formed in the stepper motor **90** end plate **99**. Fastener **95** is arranged to draw end plate **99** against a first integral support partition **101** having a groove **102** for accommodating the shank of fastener **95**, while fastener **96** draws end plate **99** against support wall **78** having groove **103** for accommodating fastener **96**.

A paper deflector **110** is provided with first and second series of rectangular apertures **111, 112** in order to receive the paper pressure rollers described below. Deflector **110** has a generally cylindrical curved surface portion **114** and a flat flange portion **115** provided with a plurality of spring apertures **116** and a second plurality of clearance apertures **117**. The spring apertures **116** each receive a first end of one of a plurality of bias springs **119**. The other end of each of the bias springs **119** is received in a rear aperture **121** of one of a plurality of rocker arms **122** mounted on the control shaft **72**. The forward end of each rocker arm **122** has a downwardly depending tab **123** for receiving the upper end of a bias spring **125**. The other end of each bias spring **125** is received in a cuplike recess **126** integrally formed in a ledge portion **127** of base **21**. A corresponding plurality of guideposts **130**, each having a guide slot **131** is formed integrally with base **21** just to the rear of ledge **127** to provide lateral guides for the lower rearward portion of the rocker arms **122** when control shaft **72** is operated by means of lever **14**.

Each rocker arm **122** includes a pressure roller support member **135** pivotally mounted to the rocker arm **122** by means of a rivet **136** for pivotally retaining member **135** to the rocker arm **122**. Each pressure roller assembly support member **135** has a forward aperture **137** and a rear aperture **138** for supporting a first pair of smaller pressure roller assemblies **140, 141** and a second pair of larger pressure roller assemblies **142, 143**. For example, left smaller pressure roller assembly **140** is received in the apertures **137** of the two leftmost pivotable support members **135** (one end in each), and the right smaller pressure roller assembly **141** is similarly carried by the two rightmost support members **135**. Similarly, larger leftmost support roller assembly **142** is carried by the two leftmost support members **135** by the ends of assembly **142** being received in rear apertures **138**; while larger rightmost pressure roller assembly **143** is similarly arranged in the two rightmost support members **135**.

The pressure roller assemblies **140–143** are brought into pressure contact with the external surface of platen **70** (or a sheet of paper therebetween) and manipulated out of pressure contact by means of the pressure roller lever **14** described below in conjunction with FIGS. **12–14**, and a cam lever **146** having a lower guide surface **147** (FIG. **9**). When the lever **14** is pulled forwardly of the unit, shaft **72** is forceably rotated which causes the rocker arms **122** to rotate in the counter-clockwise direction as viewed in FIG. **9** against the normal bias force of bias springs **125**. Rotation of shaft **72** in this manner causes the pressure roller assemblies **140–143** to be retracted away from the platen **70** surface. When the lever **14** is pushed rearwardly of the printer, the opposite action occurs, with the individual pressure rollers being received through their apertures **111, 112** in deflector **110**. During rocking motion of the rocker arms **122**, apertures **117** in paper deflector **110** provide sufficient clearance for the location nibs **124** to maneuver.

Lever arm **14** is retained on the control shaft **72** by means of a spring clip **149** received in a clip recess **151** formed in the right end of shaft **72**.

In order to prevent bowing of the rounded central portion **153** of control shaft **72**, a central support post **154** shown in FIG. **3D** is integrally formed in base **21**. Post **154** has a ledge **155** with a threaded aperture for supporting the rear portion of a keeper tab **156** having a tongue portion **157** for applying downward pressure on the grounded central portion **153**.

Base **21** has an upper rear platform portion **160** located rearwardly of the control rod **72** and paper deflector **110**, which platform provides a support surface for a first group of electronic components which comprise the power generating components and thus the principal source of heat during electrical operation of the printer. This platform **160** terminates at the rearward edge in the ribbed thermal mass **20** to provide an integral heat sink for the electrical power components. In addition, the lateral support wall **101** in combination with the platform section **160** and the upstanding rear wall portion **20** provide radiation shielding for the electrical components to be mounted therein. Further, since the entire base **21** is cast from an electrically conductive metal, any static charges in the interior of the printer thus far described dissipate on the metal base **21**.

As thus far described, it will now be apparent that the mechanical elements described above can be quickly mounted to the base **21** as an entire assembly with very little effort and technical expertise. The provision of the integrally moulded support sections for the major subcomponents of the printer provides an automatic location feature for these elements. As will further be apparent, should total or partial disassembly of the mechanical portion thus far described become necessary, this may be easily accomplished again with a minimum of effort. In this connection, it is noted that, in the event of a paper jam, the paper deflector can be easily removed from the top of the machine by simply removing the cover, releasing the pressure rollers (manipulating lever **14** to the forwardmost position), and disconnecting springs **119**, without the necessity of disturbing the platen **70**.

With reference to FIG. **4**, the bottom mechanical components of the printer are seen. Base **21** has a bottom cavity generally designated by reference numeral **171** formed in the rear portion thereof. The purpose of cavity **171** is to accommodate the control electronics board (not shown). Formed in the exposed sidewall **172** of cavity **171** is a slot **173** for slidably receiving one edge of a printed circuit board. Secured to the underside of the other integral sidewall **175** is a slider bar **176** which provides the other ledge for the printed circuit. A pair of connector blocks **181, 182** are mounted to the forward edge of the enclosure **171** by means of fasteners **182** which are threaded into apertures in the blocks **181, 182** and serve to clamp the blocks against the forward wall **176** of the volume **171**. It is noted that the upper surface of volume **171** is the bottom surface of platform **160** (FIG. **3**). A plurality of apertures **185** are formed through this surface to provide thermal communication between the volume **171** and the surface above platform **160**.

Attached to connector blocks **181, 182** are ribbon cables **187, 188** which provide electrical connections between the control board and the electrical components mounted on the top side of the base **21**. Cables **187, 188** are protected by plates **28, 27** respectively.

Plate **27** is partially secured in place by means of threaded fastener **190**, while plate **28** is partially secured in place by an angled end portion **191** frictionally received in a ledge (not visible) formed in the lower surface of base **21**. The other ends of plates **27**, **28** are captured by the forward edge of plate **26**, which is fastened to the underside of base **21** by means of a plurality of fasteners **193**.

A separate heat sink plate **194** covers the rear casting wall in the region below integral heat sink portion **20**, and is fastened in place by means of screws **195**. Plate **194** has an inner slot suggested by the broken lines **196** which receives the rear edge of plate **26**.

Radiation shielding for the control board located in volume **171** is provided by the integrally formed walls **172**, **175**, **176** and **177**, the top surface of the volume **171** and large cover plate **26**.

FIG. **6** illustrates the carriage assembly designed for use with the printer thus far described. The carriage assembly comprises three major subcomponents: a lower carriage assembly **200**, an upper carriage assembly containing the print wheel hub and print wheel motor, hammer and ribbon cartridge platform assembly all generally designated with reference numeral **300** and a combined card/ribbon guide **400**. The lower carriage assembly includes a laterally spaced pair of support arms **201**, **202** joined in the rear by a support web **203** and joined in the front by a bearing tube **204**. The construction of elements **201–204** is a one piece casting, which includes a rear extension **205** for receiving a rear rod guide bearing **206** suspended therebelow by means of a generally U-shaped clip **207** with a forwardly extending tongue portion received between abutment edges **208**, **209** and fastened to extension **205** by means of a fastener **210**.

Arms **201**, **202** are provided with outboard grooved lands **212**, **213**, each arranged to receive a keeper plate **214**, **215** used to capture the carriage timing belt **49** (FIG. **16**) by means of threaded fasteners **216**. Extending laterally to the left of the arm **201** is a support bracket, also integrally formed with members **201–205**, which provides support for a connector **611** secured to one end of cable **188** (FIG. **15**).

Pressed into the open ends of bearing tube **204** are a pair of forward rod support bearings, only one of which (bearing **225**) is illustrated in FIG. **6**. An oil wetted felt washer is installed adjacent bearing **225** to keep rod **40** clean and lubricated, the washer being retained in tube **204** by means of an externally toothed push-in retainer ring. As will now be apparent, the lower carriage assembly is slidably supported on forward support rod **33** and rear support rod **40** (FIG. **3**) by means of bearing **206** and bearing **225** (and its unseen left counterpart), and translated parallel to the platen **70** by means of the timing belt **49** secured by means of keepers **214**, **215**.

The upper carriage assembly includes a main support member **305** having an upwardly extending flange portion **306** for supporting the hammer solenoid **307** secured thereto by means of a locknut **308**. Member **305** is generally shaped in the form of a unitary yoke pattern having a pair of sidewalls **311**, **312** for supporting the print wheel motor (not shown) terminating in the print wheel hub **315** designed to receive a removable print wheel. Depending downwardly from a lower flange **317** is a spring clip **318** designed to provide a locking detent with the recessed wall portion **231** of the lower carriage frame.

Upper carriage assembly includes a ribbon drive assembly generally designated with reference numeral **330** and shown in detail in exploded view FIG. **7**. As seen in this Fig., the ribbon drive assembly includes an upper support plate **303**, a lower containment plate **331** and three spacer tubes **332** for providing adequate clearance with plate **303** for the ribbon drive components.

The ribbon drive components include a drive motor assembly **335** secured to the underside of plate **331** by means of a pair of fasteners **336** and having a driving gear on the output shaft **338** extending through a drive gear aperture **339** in plate **331**. Rotatably mounted in a bearing aperture **340** is a ribbon drive pulley **342** having a ribbed or toothed pulley surface **343**. Pulley **342** is lightly spring loaded by means of washer **344** and compression spring **345** to reduce friction between the bottom surface thereof and the top surface of plate **331**. The upper end of the shaft **346** of pulley **342** terminates in a drive slot **347** which passes through a bearing aperture **348** in plate **303** so that the slot **347** protrudes above the upper surface of plate **303**. When assembled, a drive belt **350** is received about the driving gear **338** and the pulley surface **343** to transfer motion from the motor **335** to the driving slot **347**.

Press fitted into essentially rectangular apertures **352**, **353** formed in plate **303** are a pair of ribbon cartridge latches **354**, only one of which is illustrated. With reference to FIGS. **7A** and **7B**, the cartridge latch **354** is an integrally moulded element having a stiff but flexible capture leg **355** terminating in a retaining lip **356** for engaging the upper surface of plate **303**. Latch **354** further includes a lower pair of oppositely laterally extending flanges **357**, **358** and a vertically spaced flat surface portion **360** connected to the lower flanges **357**, **358** by means of a web **361**. A vertically arranged stiffener web **362** joins a curved surface portion **364** and a serrated upper portion **365** to the surface portion **360**. Latch **354** further includes an angled keeper nib **366** having an upper abutment edge **367**. Latch **354** is installed in plate **303** by inserting the leg **355** into aperture **352** or **353** until nib **366** clears the lower edge of plate **303**. In this position, edge **367** retains latch **354** in the aperture against upward motion of the latch, while the lower surface of flange **357** and lip **356** prevent downward motion of the latch by virtue of contact against the upper surface of plate **303**. Latch **354** is designed to be flexed away from the central portion of plate **303** when a cartridge is attached to the upper carriage assembly, the side wall of the cartridge being held by the corner portion **368** of latch **354**. To release a cartridge, the upper portion of the latch **354** is manually flexed outwardly by means of serrated surface portion **365**. Latch **354** is preferably moulded from Delrin.

The ribbon drive portion **330** of the upper carriage assembly is completed by four rubber cartridge bumpers **371**, each of which is press fitted into a corresponding aperture **372** formed in the upper plate **303** and provides an upward compression force against the bottom surface of the ribbon cartridge to prevent rattling, buzzing or other vibrations during printer operation.

The combination card/ribbon guide **400** (FIG. **6**) comprises a lower flange portion **401** affording a mounting surface to the lower carriage assembly by means of fasteners **402** arranged to be threadably engaged in corresponding apertures **403** formed in the extending ledge portion of element **204**. The flange portion **401** is formed at essentially a right angle to the upstanding frame portion **404** terminating in the rear edge **405** of

the upper guide portion. Secured to this portion by means of rivets or the like is the forward ribbon guide portion **406**. The card/ribbon guide is formed from any suitable material, such as spring steel.

FIG. **8** illustrates the manner in which the upper and lower carriage assemblies are operatively connected to one another. As seen in this Fig., a support stud **321** secured in support arm **312** is bottomed in a cradle slot **233** formed in arm **202**. The unillustrated left side of the apparatus has comparable elements. A tension spring **235** is anchored at the lower end to a retaining post **236** in arm **202** at a point below the axis of stud **321**. The upper end of tension spring **235** is attached to a support post **325** secured to arm **312**. A guide washer **327** is secured to arm **312** by a screw **328** passing through an eccentric or off center aperture in washer **327**. The hidden side of the carriage assembly is arranged with similar elements.

In the operative position illustrated in full in FIG. **8**, the upper carriage assembly **300** is pivotally supported by stud **321** in slot **233**. Springs **235** provide downward tension force to help maintain the carriage in the print position illustrated, and detent **318** provides a positive detent with edge **231**. The eccentric washers **327** bear on the ramp edge **240** of side arms **202** and **201**, and the attitude of upper assembly **300** relative to lower assembly **200** can be angularly adjusted.

When it is necessary to manipulate the carriage assembly to the nonworking position illustrated in broken lines in FIG. **8**, the upper carriage assembly **300** is manually rotated to pivot about studs **321**. As upper carriage assembly **300** rotates clockwise, as viewed in FIG. **8**, the tension springs **235** pass over center with respect to stub axle **321** and provide a light detent force to hold the upper carriage assembly **300** in the open position.

Returning to FIG. **3**, the forward portion of base **21** includes two additional integral support posts **194, 195** each having a support ledge **196, 197** which, along with ledge **198** of post **32** provide bottom bottom edge support for a control panel for the printer shown in phantom. The top edge of the control panel is clamped by means of bolt, nut and washer assemblies **199**.

With reference to both FIGS. **3** and **10**, an out-of-paper switch assembly **500** includes a pair of integrally formed support posts **501, 502** each having a flat pedestal surface **503, 504**. Surface **503** has a threaded aperture **505** and surface **504** has a location tang **506** flanking a central hollow portion **507**. A microswitch **508** is secured to an intermediate adjustment plate **510** by means of screws **511, 512** and nuts **513, 514**. Enlarged aperture **516** affords adjustability to the switch-plate assembly, which is secured to post **501** by means of screw **517** and secured against lateral movement by the interference fit provided by tang **506** and plate aperture **518**. Removably attached to the arm **520** of microswitch **508** is a paper sensor **521**, preferably fabricated from moulded plastic. In use, the presence of paper just above and slightly to the rear of the platen **70** maintains the switch **507** in one switch configuration. When the paper supply is exhausted, the forward contact edge of sensor **521** is released, and an internal bias spring in switch **508** forces arm **520** forward, causing the switch **508** to assume an alternate switch configuration to signify an out-of-paper condition.

It should be understood that switch assembly **500** is designed to sense an out-of-paper condition when the printer is operated in conjunction with an auxiliary tractor feed mechanism (not shown) using conventional edge perforated paper. As is typical with such printer operation, the pressure rollers are maintained in the relaxed position (lever **14** fully forward). When operated in regular platen paper feed mode (lever **14** fully rearward), switch assembly **500** is deactivated by means of an override element **523** having a square aperture **524** received on control rod **72**. Element **523** has a switch operating blade portion **526** receivable in a slot **527** formed in adjustment plate **510**, so that blade portion **526** biases switch arm **520** rearwardly when rod **72** is in the pressure rollers biased position (lever **14** fully rearward).

Switch assembly **500** is designed to be supplied as an option for the printer. When the printer is ordered from the factory with this option, the override element **523** of FIG. **10** is used. When the option is added later (i.e., after sale), installation of assembly **500** is facilitated by the use of the modified override element **530** illustrated in FIG. **11**. As seen in this Fig., element **530** has a blade portion **531** similar to blade portion **526**. The main body portion of element **530**, however, is designed in C-shaped fashion to be snap-fitted onto rod **72** from above, thereby avoiding the need to remove rod **72** from the printer in order to install the option.

FIGS. **12–14** illustrate the unique four link pressure roller operating mechanism employed in the preferred embodiment. As seen in these Figs., the one-piece moulded lever **14** has an inner element **550** to the bottom of which a link arm **551** is pivotally attached by means of a rivet **552**. The other end of link arm **551** is pivotally attached to a drive plate **553** also by means of a rivet **554**. Drive plate **553** is rigidly connected to a camming plate **555** by means of a connector shaft **556** staked at either end to an appropriately shaped aperture in elements **553** and **555**. For ease of fabrication, elements **553** and **555** may be identical. Shaft **556** is received in a notch **558** formed in partition **78** to provide rocking support for the shaft **556**. Cam plate **555** has a first camming surface **561** which engages surface **147** of lever **146** (FIG. **9**) when the lever **14** is in the fully rearward direction and the pressure rollers are engaged; and a second camming surface **562** which bears against the lever surface **147** when the lever **14** is in the fully forward position (pressure rollers released). The manner in which the lever **14** elements mechanically co-act with one another is considered to be self evident from FIGS. **13** and **14**.

FIG. **15** illustrates the printer assembly with the carriage assembly installed on the front and rear carriage guide rods **33, 40**, and also illustrates the following additional features. The rear carriage guide rod **40** is provided with a rubber bumper **601** at the left-most position which provides a resilient limit stop for carriage motion to the left. A similar bumper (not shown) is provided on the extreme right end of rear carriage guide rod **40**.

FIGS. **15** and **17** further illustrate the paper bail assembly used in the preferred embodiment. As noted above, the lower support portion **44** of the paper bail brackets provides the keeper for the extreme ends of rear carriage guide rod **40**. Rockably attached to each paper bail support bracket **603** is a bail assembly having an end bracket **604** for receiving the ends of the paper bail **605**. The left bail element **604** is linked to the bail operating lever **13** by means of a link wire **607** received in mounting apertures **608, 609**. When lever **13** is pulled forwardly, the bail **605** is retracted forwardly; similarly,

when lever **13** is manipulated rearwardly, bail **605** is placed in the rearward position.

Also seen in FIG. **15** is connector **611** to which ribbon cable **188** is coupled, and which is releasably mounted on the connector platform **220**.

Lastly, also evident in FIG. **15** is a supplementary mounting plate **621** having upstanding clip edges **622** for receiving the forward edge of the printer cover (not shown), and which is secured to the forward edge of casting **21** by means of suitable fasteners received through plate apertures **623** and casting apertures **624**.

As will now be apparent, the carriage assembly is relatively simple in overall construction and can be readily assembled with a minimum of technical expertise. The eccentric adjustment mechanism affords a range of positional adjustment for the upper and lower carriage assemblies which is more than sufficient. In addition, the eccentric adjustment mechanism is extremely simple to install and use. The cartridge latch is extremely simple in construction, comprising a unitary molded element and provides the necessary latching function while being extremely simple to insall.

While the above provides a full and complete disclosure of the invention, various modifications, alternate constructions and equivalents may be employed without departing from the spirit and scope of the invention. For example, the invention can have application to printers having different printing mechanisms than rotary print wheels. Therefore, the above should not be construed as limiting the invention, which is defined by the appended claims.

What is claimed is:

1. A carriage assembly for a printing device having a print mechanism to be translated along a linear print path, said carriage assembly comprising:

upper carriage means for supporting said print mechanism;

lower carriage means for supporting said upper carriage means, said lower carriage means comprising a unitary member having a pair of laterally spaced arm members each having an open pivot slot and a support ramp portion located rearwardly of said slot, a rear tube portion joining said arm members at the rear, a front cross brace joining said arm members at the front, said rear tube portion being dimensioned to accommodate a first carriage support rod, and front bearing means carried by said front cross brace and dimensioned to accommodate a second carriage support rod so that said lower carriage means is carried by said first and second carriage support rods;

said upper carriage means including a pair of laterally opposed laterally extending support studs, each received in a different one of said pivot slots and removably supported thereby, and a pair of laterally opposed adjustable guide members, each located rearwardly of the respective one of said support studs, said guide members normally engaging corresponding support ramp portions when said carriage assembly is in a first operative position to establish the relative positions of said upper and lower carriage means; and

spring means coupled between said upper and lower carriage means in the region adjacent the pivot portions and arranged to provide a spring detent for said upper carriage means with respect to said lower carriage means in said first operative position and in a second inoperative position.

2. The invention of claim **1** wherein said adjustable guide members are eccentric washers.

3. The invention of claim **1** wherein said lower carriage means arms members each includes a laterally extending land portion located adjacent said rear tube portion, and wherein said carriage assembly further includes means for securing a carriage translation belt to said laterally spaced arm members, said securing means including a pair of keeper means each configured to capture an end of the carriage translation belt between the keeper means and the associated land portion when the keeper means are installed.

4. The invention of claim **1** wherein said upper carriage means includes a ribbon drive assembly having an upper platform with at least one cartridge latch aperture, and at least one cartridge latch removably mounted in said platform aperture.

5. The invention of claim **4** wherein said latch comprises a unitary member having a lower flexible upwardly opening U-shaped portion with one leg terminating at an upper end in an outwardly extending flange and the other leg having an outwardly extending keeper nib located below oppositely extending flange portions and spaced therefrom, an upper portion having a cartridge abutment surface, and a relatively stiff web portion joining said upper portion to the top surface of said flange portion.

6. The invention of claim **5** wherein said upper portion of said latch includes a substantially flat floor portion, an upwardly extending angled wall portion joined to said floor portion along an edge, a top portion joined to the upper edge of said wall portion, and a vertical web extending between said top portion and said floor portion.

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